

1979

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Recommended Citation

Phillips, G. S., & Reis, L. A. (1979). Distribution and Ecology of *Orconectes iowaensis* Fitzpatrick and *Orconectes rusticus* (Girard) in Minnesota. *Journal of the Minnesota Academy of Science*, Vol. 45 No.3, 18-19.

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Distribution and Ecology of *Orconectes iowaensis* Fitzpatrick and *Orconectes rusticus* (Girard) in Minnesota

GARY S. PHILLIPS* and LARRY A. REIS**

ABSTRACT. During 1979, a field study was conducted to determine the species of crayfish present in southern Minnesota. Specimens of *Orconectes iowaensis* Fitzpatrick, *Orconectes rusticus* (Girard), and *Orconectes virilis* (Hagen) were collected. These represent new state records for *O. iowaensis* and *O. rusticus*. *O. iowaensis* appears restricted to the Root River drainage system in extreme south-eastern Minnesota. *O. rusticus* was found in the West Fork of the Des Moines River in southwestern Minnesota and the Cedar River drainage system in south central Minnesota. Notes on the ecology of these species are included.

Although no survey of the crayfishes has been completed for the state of Minnesota, a number of publications list species collected in the state and suggest distribution patterns. These works include the taxonomic monograph of Faxon (1885) and the ecological catalogue of Harris (1903) as well as surveys by Creaser (1932) for Wisconsin, Williams and Leonard (1952) for Kansas and Crocker and Barr (1968) for Ontario, Canada. Taxonomic work dealing with Minnesota crayfish was completed by Herrick (1882) with a description of *Orconectes immunis* (his *Cambarus signifer*). This work also included a brief discussion of the distribution and sexual dimorphism of *Orconectes virilis* (his *Cambarus virilis*). Natural history studies of *O. virilis* and *O. immunis* have been conducted by Caldwell and Bovbjerg (1969) in northwestern Iowa and southwestern Minnesota. Bovbjerg (1970) also studied the ecological isolation and competitive exclusion of these 2 species in this region. Hobbs (1972), in his *Crayfishes (Astacidae) of North and Middle America*, listed *Cambarus diogenes diogenes*, *O. immunis*, *O. virilis*, and *Procambarus acutus acutus* as occurring in Minnesota. This work represents the most recent and comprehensive consideration of the Minnesota crayfishes.

Between March 1977 and September 1978, a survey was conducted by this author to determine the species of decapod crustaceans present in Iowa and their distribution. Field collections made during this study revealed the presence of *Orconectes rusticus* in the Cedar, Shell Rock, and West Fork of the Des Moines River and *Orconectes iowaensis* in the Upper Iowa River. The occurrence of these species in river systems originating in Minnesota suggested the possible presence of *O. rusticus* and *O. iowaensis* in that state. For this reason, a field study was conducted during 1979 to verify the presence and determine the distribution of these 2 species of crayfish in Minnesota.

Seining and dip-netting employed

The field collections were made by seining, dip-netting, and hand collecting. Specimens from each locality were killed and preserved in a 5 percent formalin solution as described by Edmonds (1976). Specimens from this survey are deposited at the National Museum of Natural History, Washington, D.C.

Prior to this study, *O. iowaensis* had not been reported from Minnesota. Hobbs (1972) listed this species as occurring

only in northeastern Iowa. Within Iowa, *O. iowaensis* was reported from the Upper Iowa, Yellow, Turkey, and Maquoketa River systems as well as from the Mississippi River north of Dam 10.

The 1979 field collections established the presence of *O. iowaensis* in southeastern Minnesota. Within this part of the state, *O. iowaensis* was collected from Trout Creek in Olmsted county and the North Branch of the Root River, Deer Creek, the South Branch of the Root River, and the South Fork of the Root River, all in Fillmore county. Locations of the collection sites in Minnesota of this species are shown in Figure 1.

This species appears restricted in distribution to the Root River drainage system, as it was not collected in drainage systems north or west of the Root. While this species is found in the Upper Iowa River in Iowa, it was not collected from headwaters of that river within Minnesota. from headwaters of that river within Minnesota.

O. iowaensis is typically found in clear, cool, rock-bottomed streams. In such streams, this species is frequently found in large numbers in riffle areas where individuals spend most of their time in shallow hides constructed under rocks. In the Root River drainage system, *O. iowaensis* was typically encountered in the middle reaches of streams where rock bottoms and abundant riffles were prevalent. Mating between mature females and form I males occurs from mid-July through September. Eggs are laid the following spring, from late April to early June and are carried for approximately five weeks. Adult females molt shortly after the brood leaves. Form I males molt earlier, going from the form I winter condition to form II. This usually occurs in May. A second molt from form II to form I occurs in mid-July, just prior to mating. Depending on hatching dates and water conditions, some juveniles may mature during their first year. Most, however, do not reach maturity until their second summer. This species is usually collected in association with *O. virilis*.

With the exception of a single collection reported by this author, no prior records of *O. rusticus* from Minnesota are known to exist. Hobbs (1972) reported the range of this species as being Illinois, Indiana, Iowa, Kentucky, Maine, Massachusetts, Michigan, New Mexico, Ohio, and Ontario, Canada. Additional records include those of Page and Burr (1973) who collected *O. rusticus* from streams in northeastern Missouri and Lorman (1975) who studied the ecology of this species in a northern Wisconsin lake. The presence of *O. rusticus* in Wisconsin appears the result of artificial introduction, as it was not reported by Creaser (1932) during his survey of that state.

Field collections made during this survey in southern Minnesota established the presence of *O. rusticus* in the following counties: Cottonwood, Jackson, Mower, and

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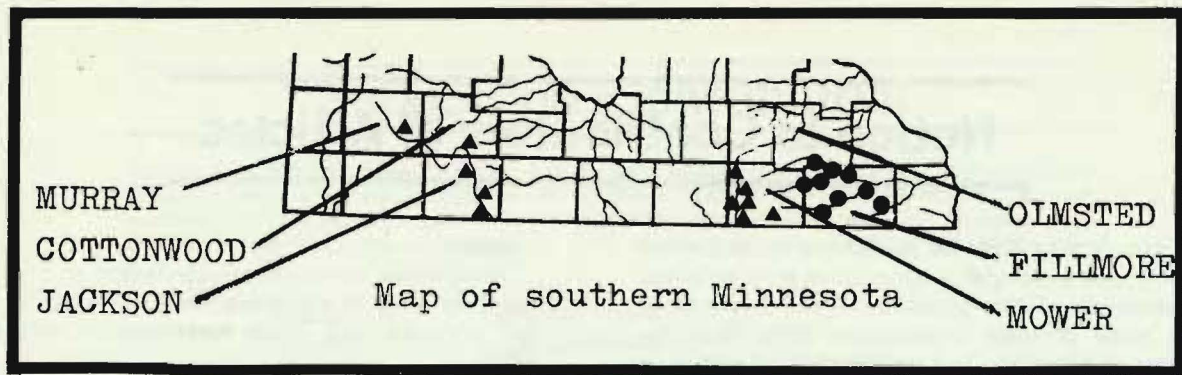


Figure 1. — Distribution of *Orconectes iowaensis* Fitzpatrick and *Orconectes rusticus* (Girard) in Minnesota. (*Orconectes iowaensis* - ▲ *Orconectes rusticus* - ●)

Murray. Within the state, this species appears restricted to the West Fork of the Des Moines River and Cedar River drainage systems. Locations of the collection sites of this species in Minnesota are shown in Figure 1.

Typically a stream dweller, *O. rusticus* usually prefers rock-bottomed, warm water streams of moderate size. In such streams, *O. rusticus* occurs most frequently in rock riffle areas where individuals are found in shallow hides under rocks. In Minnesota, this species also is found in the headwater regions of streams where the habitat consists of a series of deep sand-bottomed pools separated by shallow gravel riffles. Under these conditions, *O. rusticus* can be found under debris in the riffle areas and along the vegetation which borders the pool areas. No specimens of this species were collected from similar headwater habitats in Iowa. The life history of *O. rusticus* in Minnesota is very similar to that of *O. iowaensis*. This species, like *O. iowaensis*, is usually collected in association with *O. virilis*.

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